Ebola: Immune Avoidance & Global Impact

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BACKGROUND

Figure 1. Background info on Ebola

- Caused by Zaire *ebolavirus*: a virus within *Ebolavirus* genus & *Filiviridae* family
- Filoviruses: negative-stranded RNA viruses that affect wide ranges of tissues

Transmission

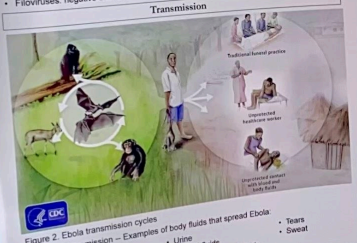

Figure 2. Ebola transmission cycles

Routes of transmission – Examples of body fluids that spread Ebola

- Blood
- Feces
- Vomit
- Semen
- Saliva
- Breast milk
- Urine
- Vaginal fluids
- Pregnancy- related fluids
- Tears
- Sweat

Symptoms

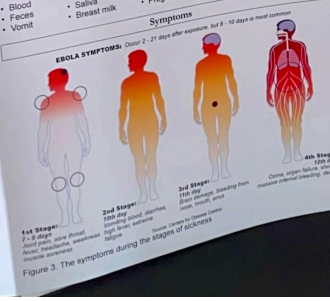

Figure 3. The symptoms during the stages of sickness

BIOLOGICAL MECHANISM

rVSV-ZEBOV vaccine

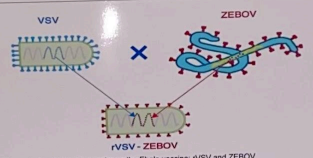

Figure 4. Two factors that make up the Ebola vaccine: rVSV and ZEBOV

More about the Ebola vaccine:

- It's a recombinant virus (cannot reproduce when injected)
- rVSV = vesicular stomatitis virus (prototype of RNA viruses)
- The VSV glycoprotein replaces ZEBOV glycoprotein
- Induces humoral and cellular immune responses

Avoiding innate immune response

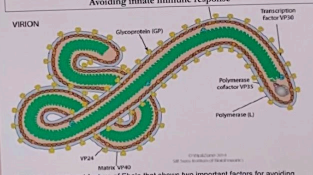

Figure 5. A structural feature of Ebola that shows two important factors for avoiding innate immune response: the glycoprotein (GP) and virion proteins (VP)

- VP35 + VP24 = innate response antagonist domains to protect against host antiviral activity, when infected, restrict early IFN production & signaling
- IFN = interferons that get alerts from immune system
- GP = acts as a roadblock between virus GP & anti-GP antibodies
- GP = can be protected from immune recognition by GP1 glycosylation, which allows for binding to the host cell

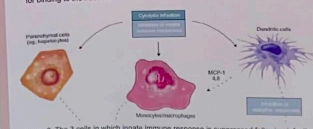

Figure 6. The 3 cells in which innate immune response is suppressed following infection

- Lack of DC maturation is resulted from VP35 avoiding immune response
- EBOV inhibits DC maturation which affects the activation of innate & adaptive immunity
- Dendritic cells = susceptible to survive EBOV infections & then can help the spread

IMPACTS

The 2014 – 2016 Ebola outbreak, also known as the West African Ebola epidemic was the biggest Ebola outbreak worldwide. There are many ways this outbreak impacted the world.

Society

- 28,600+ cases & 11,300+ deaths
- Biggest reason for spread = crowded urban area, conflict between key control practices, etc...
- People scared to share results + quarantine because they weren't given necessities (food, water)

Children

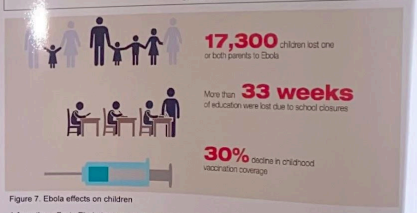

Figure 7. Ebola effects on children

A few other effects Ebola had on children include:

- 20% of all cases = children under 15
- Children worked to help provide for families

Media + America overreaction

- Media portrayed Ebola aggressively through photos of death & separation. Other diseases = not portrayed in this racist, aggressive manner
- America overreacted due to media spreading fear
- Immigrants + those with African descent = faced wrath of ignorant Americans
- Anyone who visited any part of Africa = harassed in the U.S.
- U.S. politicians used the overreacted fear of Ebola for political gain

Economy

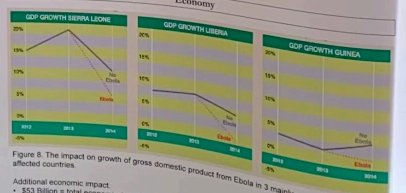

Figure 8. The impact on growth of gross domestic product from Ebola in 3 mainly affected countries.

Additional economic impact:

- $53 Billion = total economic & societal cost (loss of human life, survivor's long-term conditions, treatment, infection control, deaths by other unrelated disease)
- $3.6B spent for aid = from US, Germany, UK, & world bank

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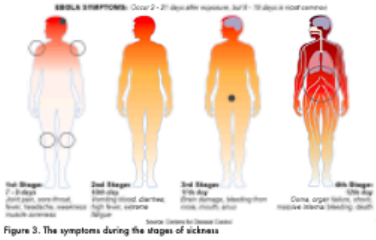

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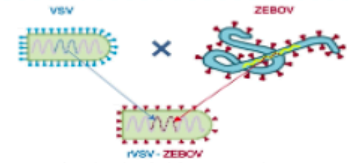

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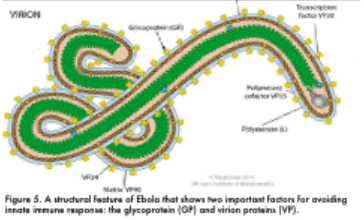

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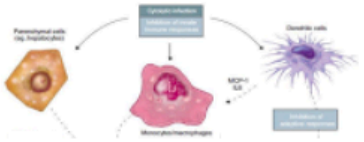

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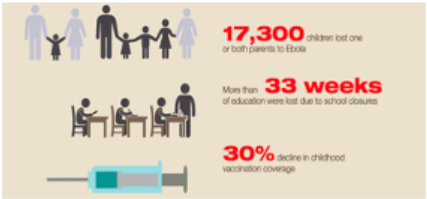

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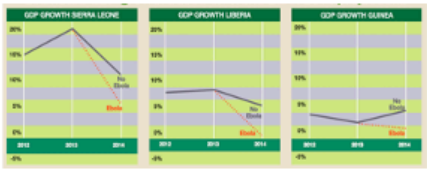

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